REMARKS

Claims 1-5, all the claims pending in the application, stand rejected. Claim 1 is amended to add the limitation that the mixed gas contains no hydrogen gas. Support for this limitation is present in the original application at page 4, line 19 to page 5, line 28.

(3) Sakaguchi fails to disclose the above-mentioned feature of the present invention. Specifically, Sakaguchi uses the mixed gas of the hydrocarbon-based gas, the hydrogen gas and the nitrogen gas as the reactant gas, as described in paragraphs 0237-0239. However, as described above, if the mixed gas of the hydrocarbon-based gas and the hydrogen gas is used as the material gas, hydrocarbons decomposed in plasma form the carbon-hydrogen bond to form polymer particles. The particles adhered to the surface of the protection layer form protrusions causing the thermal asperity.

By contrast, according to the present invention recited in the amended claim 1,

the mixed gas (containing no hydrogen gas) of the hydrocarbon-based gas and the nitrogen gas is used as the material gas. Consequently, carbon-hydrogen bond is not formed to form polymer particles. Accordingly, protrusions causing the thermal asperity are not formed also.

Furthermore, Sakaguchi also fails to disclose using the mixed gas of the hydrocarbon-based gas and the nitrogen gas without containing an inactive gas.

Moreover, Suzuki fails to disclose the above-mentioned feature of the present invention.

As discussed above, the present invention is clearly different from the cited references. Therefore, the present invention is patentable over the cited references.

Claim Rejections - 35 USC § 102

Claims 1-2 and 5 rejected under 35 U.S.C. 102(b) as being anticipated by Sakaguchi et al (2002/0064606). This rejection is traversed for at least the following reasons.

Claim 1

As described at page 4, line 19 to page 5, line 28 of the original specification, traditionally, as a material gas for forming a carbon protection layer by plasma CVD, a mixed gas comprising an inactive gas (such as Ar) and a hydrocarbon-based gas is used. It is also known to use a hydrocarbon-based gas alone as the material gas, or to use a mixed gas of a

hydrocarbon-based gas and a hydrogen gas as the material gas. In case where deposition is performed by plasma CVD using the above-mentioned material gas known in the art, hydrocarbons decomposed in plasma form a carbon-carbon bond or a carbon-hydrogen bond and the carbon protection layer is formed on a disk substrate. However, a part of hydrocarbons are not decomposed or insufficiently decomposed during the above-mentioned process but are aggregated and fused together to form polymer particles. The polymer particles are partly incorporated into the protection layer as a part thereof. The remaining polymer particles not incorporated into the protection layer are attached to an inner wall of a deposition chamber and, at a particular frequency or probability, drop down from the wall to be adhered to the surface of the protection layer as the particles. The particles adhered to the surface of the protection layer form protrusions causing a thermal asperity. Further, at positions where the polymer particles are incorporated into the protection layer, the film strength of the protection layer is significantly decreased so that the LUL durability required to the magnetic disk apparatus of a LUL system can not be obtained.

According to the study performed by the present inventors, it has been found out that, by depositing a carbon-based protection layer containing hydrogen and nitrogen by the use of a mixed gas of a hydrocarbon-based gas and a nitrogen gas as a material gas for forming the protection layer by plasma CVD without using an inactive gas such as Ar, it is possible to suppress adhesion of the hydrocarbon-based organic polymer to the surface of the protection layer in the form of particles. The inventors believe that suppression occurs because, by using a mixed gas of a hydrocarbon-based gas and a nitrogen gas without an inactive gas, production of the organic polymer compound causing the particles is suppressed.

Further, by using a mixed gas that has a hydrocarbon-based gas and a nitrogen gas (without containing hydrogen gas) as a material gas for forming the protection layer by plasma CVD, and without using an inactive gas and, it is possible to suppress adhesion of the hydrocarbon-based organic polymer to the surface of the protection layer in the form of particles. This is a feature of the present invention.

Sakaguchi

In framing the rejection of claim 1, the Examiner asserts that Sakaguchi teaches a method of producing a magnetic disk wherein a magnetic layer (32) is formed on a disk substrate (S)

(Figure 2), and a carbon-based protection layer (33) is thereafter formed by plasma CVD (paragraphs 0218 - 0220, Figure 1), using a mixed gas comprising a hydrocarbon-based gas and a nitrogen gas without containing an inactive gas (paragraphs 0237 — 0239). The Examiner asserts that the process is performed under the condition that the disk substrate with the magnetic layer formed thereon is kept at 250°C (paragraphs 0166 - 0168).

Applicants respectfully submit that Sakaguchi fails to disclose the use of a mixed gas that does not contain hydrogen. Specifically, Sakaguchi uses the mixed gas comprising a (1) hydrocarbon-based gas, (2) a hydrogen gas and (3) a nitrogen gas as the reactant gas, as described in paragraphs 0237-0239. Thus, Sakaguchi encounters the problems that Applicants have solved by eliminating hydrogen gas. Specifically, because the mixed gas in Sakaguchi is a hydrocarbon-based gas and a hydrogen gas, hydrocarbons that are decomposed in plasma form a carbon-hydrogen bond and result in the formation of polymer particles. The particles are adhered to the surface of the protection layer and form protrusions, causing the thermal asperity.

By contrast, according to the present invention as now recited in amended claim 1, the mixed gas (containing no hydrogen gas) of the hydrocarbon-based gas and the nitrogen gas is used as the material gas. Consequently, a carbon-hydrogen bond is not formed so that polymer particles are not formed. Accordingly, protrusions causing the thermal asperity are not formed also. Finally, Sakaguchi also fails to disclose using the mixed gas of the hydrocarbon-based gas and the nitrogen gas without containing an inactive gas.

Thus, due to the absence of two limitations in claim 1, Sakaguchi cannot anticipate the invention.

Claims 2 and 5

The Examiner asserts that Sakaguchi teaches that the mixed gas is a mixture of a low-molecular weight straight-chain hydrocarbon-based gas (paragraph 0094 for definition of low-molecular-weight, paragraph 0237 for description of mixture, paragraph 0238 for listing of allowable hydrocarbons which include Applicant's selection) and a nitrogen gas (paragraph 0237).

The Examiner asserts that Sakaguchi teaches that the magnetic disk is for use in a magnetic disk apparatus of a load/unload system. Examiner takes the position that the product resulting from the method of Sakaguchi fulfills the limitation of Claim 5 because it is capable of being used in a load/unload system.

However, as to both claims 2 and 5, the claims are patentable for the reasons given for their parent claim 1.

Claim Rejections - 35 USC § 103

Claims 3-4 rejected under 35 U.S.C. 103(a) as being unpatentable over `606 as applied to claims 1-2 above, and further in view of Suzuki et al. (6,680,112). This rejection is traversed for at least the following reasons.

Claim 3

The Examiner asserts that Sakaguchi does teach a lubricating film, wherein the upper surface of the film reduces surface friction (Paragraphs 0513-0517), but admits that Sakaguchi does not teach the limitation of Claim 3, which specifies that the method of Claim 1 further comprises exposing the carbon-based protective layer to nitrogen plasma after forming the carbon-based protection layer.

Suzuki et al

The Examiner looks to Suzuki et al for a teaching that using an etching gas, wherein nitrogen is explicitly cited as a valid example among other gases that can generate a plasma (Column 5 Lines 16-29), allows for controlling the affinity of the DLC film to a lubricant film (Column 4 Lines 21-45, 50-56), promoting adhesion of the lubricant film to the DLC film. Examiner takes the position that the invention of Claim 3 is suitable for use in a CSS system, and that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have applied the plasma-etching step of Suzuki et al to the selected method of Sakaguchi because Sakaguchi teaches a lubricating film, Suzuki et al teaches a method to improve the affinity between the lubricating film and the DLC film, and the selection of something based on its known suitability for its intended use has been held to support a prima facie case of obviousness.

Applicants would note that Suzuki et al fails to disclose the above-mentioned features of the present invention with respect to claim 1, namely (1) a material gas that does not have hydrogen and (2) the absence from the mixed gas of an inactive gas. Thus, for the reasons given above, the present invention is clearly different from the cited references. Therefore, the present invention is patentable over the cited references.

Claim 4

With specific regard to Claim 4, the Examiner asserts that Sakaguchi further teaches forming a lubrication layer after exposing the carbon-based protection layer to nitrogen plasma (paragraph 0247). However, the claim would be patentable over the combination of Sakaguchi and Suzuki et al for the reasons given for claim 1, namely (1) the use of a material gas that does not have hydrogen and (2) the absence from the mixed gas of an inactive gas.

Based on the foregoing argument, all of claims 1-5 are patenatable.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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